CLAIMS

1. A method of forming a structural airframe component for an aircraft including placing at least two components in abutting relationship with each other and joining them together by friction stir butt welding.

2. A method as in claim 1 in which the structural airframe component comprises an aircraft wing rib and the at least two components comprise a central web element and a rib foot element and the method includes the steps of joining together the central web element and the rib foot element by partial penetration friction stir butt welding and subsequently machining away material from at least one of the central web element and the rib foot element in the region of the abutment until the weld becomes a full penetration weld.

3. A method as in claim 2 including the steps of providing a said rib foot element of L-shape cross section and carrying out the machining away of material at least from the rib foot element to form a rib foot of T-shape cross section.

4. A method as in any preceding claim including the step of applying a weld fatigue resistant feature to a run-out of the weld.

5. A method as in claim 4 in which the fatigue resistant feature is a cold worked hole having a fastener inserted therein.

6. A method as in claim 4 or 5 in which the fatigue resistant feature includes shot peening in the region of the weld runout.

7. A method as in claim 4 in which the fatigue resistant feature is a splice strap fastened in position transverse to the direction of the weld joint.

8. A method as in any of claims 4 to 7 in which the fatigue resistant feature includes a thickening of the material of the welded component in the region of the weld run-out.

9. A method as in any preceding claim including the step of relieving residual stress in the weld by machining off a surface of the weld to a depth of at least substantially 0.10mm.

10. A method as in any preceding claim applied to components having a varying thickness of material to be welded together by inserting the said probe into the joint between the two components to a depth dependent upon the material thickness at the position of probe entry and varying the depth

of probe insertion according to the said material thickness as welding progresses.

11. A method as in claim 10 including varying at least one of the rate of feed of the probe along the joint and the rotational speed of the probe.

12. A method as in any preceding claim in which the structural airframe component for an aircraft comprises an extruded skin stiffener and the method includes the step of placing an extruded portion of the stiffener in abutting relationship with a width-increasing region for the extruded portion and joining them together by friction stir butt welding.

13. A structural airframe component for an aircraft including at least one friction stir butt welded joint.

14. A structural airframe component as in claim 13 wherein, in the region of a said butt welded joint the component is double curvature in form.

15. A structural airframe component as in claim 13 or 14 in which a said weld is of varying thickness along its length substantially to correspond to varying material thickness of the component.

16. A structural airframe component as in claim 13, 14 or 15 in which the thickness of the component material varies across the weld joint.

17. A structural airframe component as in any of claims 13 to 16 in which at least one said weld includes a weld fatigue resistant feature at a runout of the weld.

18. A structural airframe component as in any of claims 13 to 17 in which the component comprises at least two skin panels friction stir butt welded together.

19. A structural airframe component as in claim 18 in which said at least two skin panels have a skin stiffener attached thereto along a length of a said weld by skin engaging flanges of the stiffener attached to the skin on either side of the weld.

20. A structural airframe component as in any of claims 13 to 19 in which the at least one friction stir butt welded joint joins at least two extruded integrally-stiffened wing panel sections.

21. A structural airframe component as in any of claims 13 to 20 including an aircraft skin panel having a shaped plug friction stir butt welded into place therein.

22. A structural airframe component as in any of claims 13 to 21 comprising an aircraft skin panel having at least one

first part stiffener formed integral therewith with a further part of the stiffener friction stir butt welded to the first part of the stiffener.

23. A structural airframe component as in any of claims 13 to 17 comprising a hybrid billet in which a billet of 7000 series aluminium alloy is friction stir butt welded to a billet of 2000 series aluminium alloy.

24. A structural airframe component as in claim 23 in which the billets are selected from forgings and extrusions.

25. A structural airframe component as in claim 23 or 24 comprising one of an aircraft wing rib and spar machined from a said hybrid billet.

26. A structural airframe component as in claim 25 in which said one of an aircraft wing rib and spar includes a said weld substantially along a neutral axis thereof.

27. A structural airframe component as in claim 25 or 26 including at least one said weld joining separate billets at or in the region of junctions between a central web and upper and lower booms thereof.

28. A structural airframe component as in any of claims 13 to 17 or 22 to 27 having one of an I-section and J-section cross sectional shape, of web height tapering along the length

of the component and having a friction stir butt welded joint extending along the length of the tapered web.

29. A structural airframe component as in any of claims 13 to 17 comprising an extruded aircraft skin stiffener including at least one extension region thereof extending the width of the stiffener beyond an extruded width, said at least one extension region being attached to the remainder of the stiffener by a friction stir butt welded joint.

30. A structural airframe component as in claim 29 comprising a skin stringer in which the at least one said extension region forms at least part of one of a rib growout and a spade end and other root end profile region thereof.

31. A structural airframe component as in claim 29 or 30 comprising an I-section or a J-section cross sectional shape having upper and lower booms separated by a central web with the at least one extension region being friction stir butt welded to both the upper and lower booms on at least one side of the web.

32. A structural airframe component as in any of claims 13 to 17 in which the said weld joins a wing skin panel and one of a spar and rib.

33. A structural airframe component as in claim 32 in which a part of the said one of a spar and rib forms part of an aerodynamic profile of the wing.

34. A structural airframe component as in claim 32 or 33 in which said one of a spar and rib is machined from a hybrid billet in which a billet of 7000 series aluminium alloy is friction stir butt welded to a billet of 2000 series aluminium alloy.

35. A method as in claim 9 in which the said depth is at least substantially 0.25mm.

36. A method as in claim 9 in which the said depth is at least substantially 0.50mm.

37. A structural airframe component for an aircraft manufactured by placing at least two components in abutting relationship with each other and joining them together by friction stir butt welding.

38. An airframe for an aircraft including at least one structural airframe component according to any of claims 13 to 34, or 37.

39. An aircraft wing including at least one structural airframe component according to any of claims 13 to 34, or 37.